



# **iCOMP<sup>®</sup> Index 3.0**

## **Performance Brief**

**A Simplified Measure of Relative  
Processor Performance**

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## iCOMP® Index 3.0 Performance Brief

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## **INTRODUCTION**

In 1992, Intel introduced the iCOMP Index to provide non-technical end-users with an easy-to-use tool to understand and compare the relative performance differences among Intel processors. The Index was comprised of four industry-standard benchmarks weighted to reflect the mix of 16-bit and 32-bit software applications in use at that time and those expected to be in use for the next three to four years.

In 1996, Intel updated the Index to iCOMP Index 2.0 to reflect the trend toward 32-bit software and the proliferation of multimedia applications. The Index was comprised of four industry standard 32-bit benchmarks and a multimedia benchmark that reflected software applications in use at that time and those expected to be in use for the next few years.

To reflect the rapid adoption of new technology and software that is commonly used on PCs today (e.g., the increasing use of 3D, multimedia, and Internet), Intel has updated the iCOMP Index with six industry standard benchmarks. The updated Index is called iCOMP Index 3.0.

iCOMP Index 3.0 measures Intel's families of Performance PC processors across the Spectrum of Performance. Performance measurements based on a single benchmark or application will primarily focus on a single aspect of processor performance. iCOMP Index 3.0 measures performance based on a broader, more comprehensive spectrum of processor benchmarks to provide a more complete performance perspective. iCOMP Index 3.0 measures the Spectrum of Performance through incorporating benchmarks in each of four categories: Productivity, Multimedia, 3D, and Internet. These categories are based on the usage patterns of today's PC user as well as anticipated future software trends. Through examining performance metrics in each of these four categories, PC users will obtain a better understanding of how their processor will perform on the wide variety of applications they will be using.

## SPECTRUM OF PERFORMANCE

iCOMP Index 3.0 is based on the Spectrum of Performance and is intended to reflect native Intel processor performance for the application mix that a typical end user will be using today and over the next couple of years. Multimedia, 3D, and Internet application use has increased sharply over the past few years, and this trend is anticipated to continue in the future. For this reason, a wide range of benchmarks should be considered when evaluating processor and system performance. PC users and buyers should consider the entire Spectrum of Performance, which includes productivity, multimedia, 3D, and Internet performance.

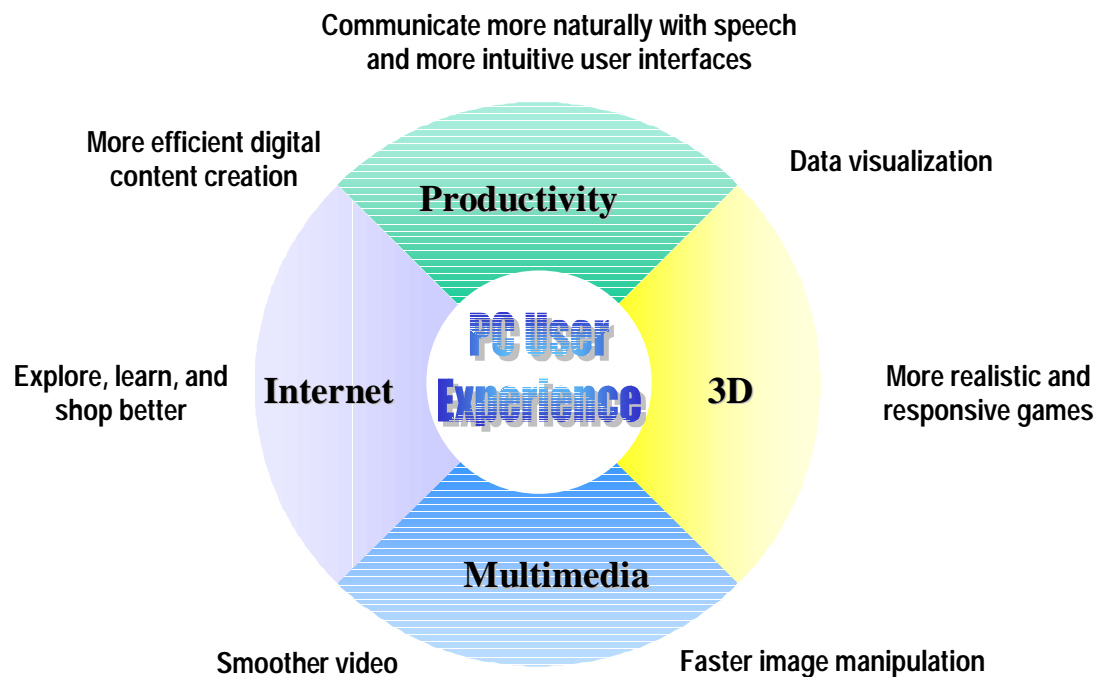


Figure 1. The Spectrum of Performance

## OVERVIEW

- **What is iCOMP® Index 3.0?** It is a weighted average of six industry standard benchmark measures of 32-bit processor performance: CPUmark\* 99, Wintune\* 98 Advanced CPU Integer Test, MultimediaMark\* 99, 3D Winbench\* 99—3D Lighting and Transformation Test, WinBench\* 99—FPU WinMark\*, and Jmark\* 2.0 Processor Test.
- **What is the Spectrum of Performance?** Intel measures processor and system performance based on the Spectrum of Performance. Performance measurements based on a single benchmark or application will often focus primarily on a single aspect of performance. For this reason, Intel measures performance based on a broader, more comprehensive spectrum of benchmarks to provide a more complete performance perspective. iCOMP Index 3.0 is based on the Spectrum of Performance.
- **Can a single number accurately reflect processor performance?** No single numerical measurement or benchmark can completely measure all aspects of the performance of a device as complex as a processor. To better reflect processor performance, iCOMP Index 3.0 presents a single number that embodies a weighted average of several processor benchmarks that measure the overall performance of a processor. This provides a tool to help PC buyers to compare the relative performance of Intel's families of Performance PC processors.
- **What changes in software and usage patterns prompted updating the iCOMP® Index?** Two major market and performance trends have influenced the latest formula revision:
  1. **Development of new or updated benchmarks.** The PC industry updates existing benchmarks, or develops new benchmarks, to reflect the unique mix of instructions for existing and emerging software.
  2. **Increasing use of 3D, multimedia, and Internet technology and software.** Another trend incorporated into the new formula is the increasing use of 3D, multimedia and Internet technology and software.
- **Can the original iCOMP® Index, iCOMP Index 2.0, and iCOMP Index 3.0 ratings be compared?** No, the ratings based on the iCOMP Index 3.0 formula cannot be compared to ratings based on the older formulas since they are derived from different sets of benchmarks, with different weightings, and are indexed to different base processors.
- **Why was the Pentium II processor at 350MHz picked as the baseline processor?** The Pentium II processor at 350MHz was chosen because it is a popular processor choice for Performance PCs at the time of the introduction of the iCOMP Index 3.0. The selection of the base processor does not change the relative rating of one processor versus another.



## **Characteristics of iCOMP® Index 3.0**

The iCOMP Index 3.0 was developed as an easy-to-use tool to help PC consumers understand the performance differences among Intel desktop processors in the performance segment and help them make better informed buying decisions. For example, it can be used to compare the relative performance of a Pentium III processor at 450MHz and a Pentium II processor at 450MHz. Intel has proactively segmented and targeted its product line in response to growth and segmentation of the PC market. Therefore, it is becoming less useful to compare all Intel processors on the same system configuration. iCOMP index 3.0 is devoted exclusively to comparing performance desktop processors, Intel's mainstream line of processors for PCs. Servers, workstations, mobile and Value PCs are increasingly sold with different system configurations. Processors in these segments can be evaluated by analyzing their performance in a system that is configured similar to the systems in which these processors are sold in the marketplace as it has evolved to date.

## **Development Criteria**

The iCOMP Index 3.0 definition was designed to have the following features:

- **Repeatability:** anyone will be able to replicate Intel's iCOMP Index 3.0 processor ratings with publicly available documentation and benchmarks.
- **Representativeness:** each benchmark component depicts the class of application which it was chosen to represent in the iCOMP Index 3.0 formula.
- **Performance:** iCOMP Index 3.0 focuses on the processor's performance.
- **Availability:** the iCOMP Index 3.0 formula and component benchmarks are publicly available. The equipment used to measure processor performance can be purchased easily from computer stores, by mail-order, or through other sources.

## iCOMP® Index 3.0 Formula

The iCOMP Index 3.0 benchmarks are selected and weighted to reflect PC usage patterns as they have evolved to date and as we expect them to evolve in the future. Intel used current research, industry trends and expert opinions as guidelines for the iCOMP Index 3.0 benchmark and weightings. The Index is forward looking in nature—it is based on today's software use and anticipated usage trends for the next few years. The following table outlines the weightings used to generate an iCOMP Index 3.0 rating:

<b>iCOMP Index 3.0 Weightings</b>	<b>%</b>
CPUmark* 99	20
Wintune* 98 Advanced CPU Integer Test	20
MultimediaMark* 99	25
3D Winbench* 99—3D Lighting and Transformation Test	20
WinBench* 99—FPU WinMark*	5
Jmark* 2.0 Processor Test	10

**Table 1. Benchmark Weightings**

- Wintune 98 Advanced CPU Integer test = 20%, and CPUmark 99 = 20%. These integer benchmarks are indicative of productivity applications.
- 3D WinBench 99 -- 3D Lighting and Transformation test = 20%. This benchmark was designed to measure the performance of the 3D geometry and lighting calculations used in 3D games.
- WinBench 99 -- FPU WinMark = 5%. Floating point performance is important for 3D games, as well as high-end productivity applications such as engineering and finance programs.
- MultimediaMark 99 = 25%. Multimedia benchmarks measure performance of audio, video, imaging, educational, creativity and numerous Internet applications.
- Jmark 2.0 processor test = 10%. This benchmark measures Java which is increasingly becoming a widely accepted technology in the Internet.

iCOMP Index 3.0 is computed by calculating the weighted geometric mean (Equation 1, below) of a processor's relative performance on each of the component benchmarks compared to a base processor. The base processor for iCOMP Index 3.0 is the Pentium II processor at 350MHz. The iCOMP Index baseline results are scaled to the rating of the Pentium II processor at 350MHz and multiplied by 100 as shown in Equation 1:

$$\text{iCOMP}^{\circledR} \text{ Index baseline} = \left( \frac{BM_1}{\text{Base\_}BM_1} \right)^{P_1} * \left( \frac{BM_2}{\text{Base\_}BM_2} \right)^{P_2} * \dots * \left( \frac{BM_n}{\text{Base\_}BM_n} \right)^{P_n}$$

### **Equation 1. General iCOMP® Index baseline formula**

An iCOMP Index 3.0 rating is calculated by rounding the iCOMP Index baseline result to the nearest hundredth and multiplying by 1000.



The benchmarks scores,  $BM_i$ , are chosen to represent each category. The category weights are represented by  $P_i$ . The  $Base\_BM_i$  corresponds to the performance of the base machine on the  $i$ th benchmark. The selection of the base processor does not change the relative rating of one processor as compared to another.

## Test System Configuration

To measure the processor's maximum performance and to isolate as much of the processor performance as possible, the iCOMP Index 3.0 rating for each processor was measured on an optimally configured system. (See Appendix B for a description of the system hardware and software configurations used to calculate the iCOMP Index 3.0 ratings.) Performance indices measured on systems with fast memory subsystems will be different from those measured on a system with a slower memory subsystem. Therefore, if an individual user calculates an iCOMP Index 3.0 rating for the processor in his or her own system, it could be different from the one Intel has specified, reflecting differences in system rather than processor performance.

## The iCOMP® Index 3.0 Chart

Figure 1 below shows the iCOMP Index 3.0 ratings for several Intel processors. The base processor is the Pentium II processor at 350MHz, which has been scaled to the value of 1000. The difference between any two Index ratings provides a relative measure of the increase in performance of one processor over another.

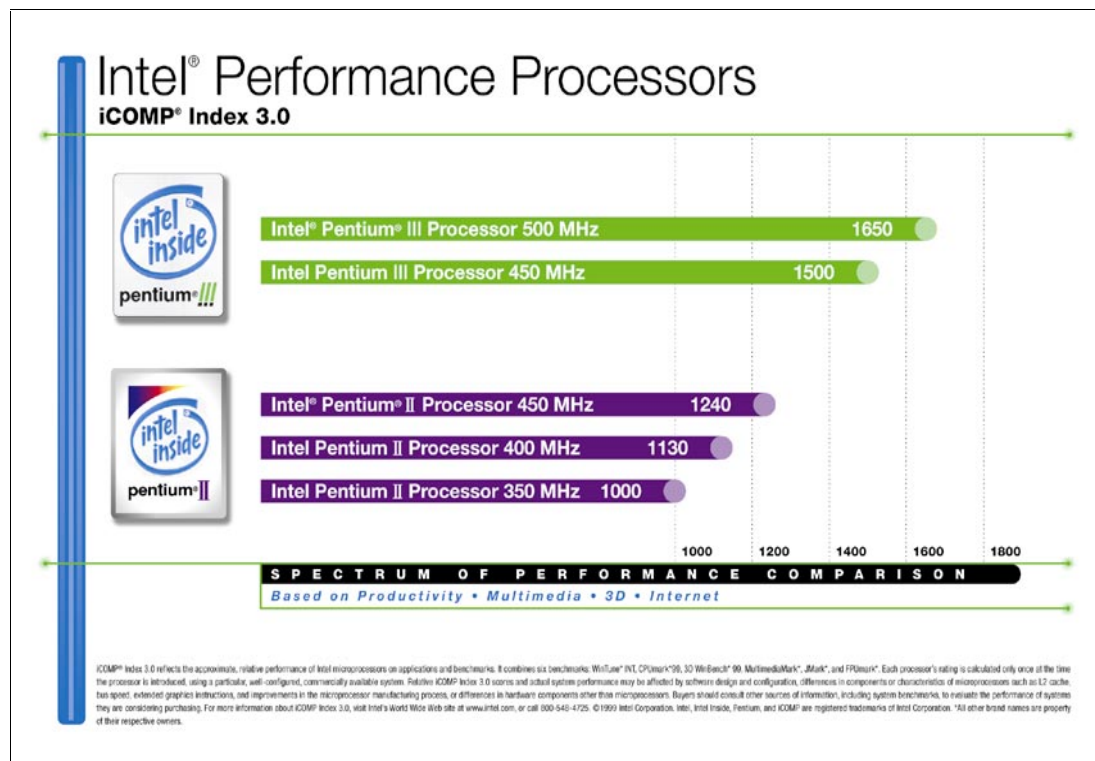


Figure 2. Chart of iCOMP® Index 3.0 Ratings. See next page for further details.



## **iCOMP® Index 3.0 Performance Brief**

iCOMP Index 3.0 reflects the approximate, relative performance of Intel microprocessors on applications and benchmarks. It combines six benchmarks: Wintune\* 98 Advanced CPU Integer test, CPUmark\* 99, 3D WinBench\* 99–CPU Lighting and Transformation test, MultimediaMark\* 99, Jmark\* 2.0 Processor Test, and WinBench\* 99–FPU WinMark\*.

Each processor's rating is calculated only once at the time the processor is introduced, using a particular, well-configured, commercially available system. Relative iCOMP® Index 3.0 scores and actual system performance may be affected by software design and configuration, differences in components or characteristics of microprocessors such as L2 cache, bus speed, extended graphics instructions, and improvements in the microprocessor manufacturing process, or differences in hardware components other than microprocessors.

Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of systems they are considering purchasing.

### **Limitations of iCOMP® Index 3.0**

Although the iCOMP Index encompasses several different aspects of processor performance, no single numerical measurement can completely characterize the performance of a device as complex as a processor. It is important to understand that the iCOMP Index is a tool for making comparisons between Intel's different Performance PC processors rather than systems. For more information on performance tests reference [www.intel.com/procs/perf/limits.htm](http://www.intel.com/procs/perf/limits.htm).

iCOMP Index 3.0 is just one tool that a PC buyer can use during the PC purchase process. Buyers should also consult other sources of information in order to better evaluate a system that they are considering purchasing.



## **CONCLUSION**

iCOMP Index 3.0 is based on the Spectrum of Performance which encompasses Productivity, Multimedia, 3D, and Internet performance. It provides a comprehensive measure of relative processor performance, and reflects the rapid adoption of new technology and software that are commonly used on PCs today (e.g., the increasing use of 3D, multimedia, and Internet), as well as the anticipated trends for software over the next couple of years. iCOMP Index 3.0 is just one tool that a PC buyer can use during the PC purchase process. Buyers should also consult other sources of information in order to better evaluate a system that they are considering purchasing. Intel hopes that the iCOMP Index 3.0 will make it easier for PC buyers to understand the relative performance differences among Intel's families of Performance PC processors, and to enable them to select the most appropriate processor to suit their needs.

## APPENDIX A. iCOMP® INDEX 3.0 WEIGHTINGS

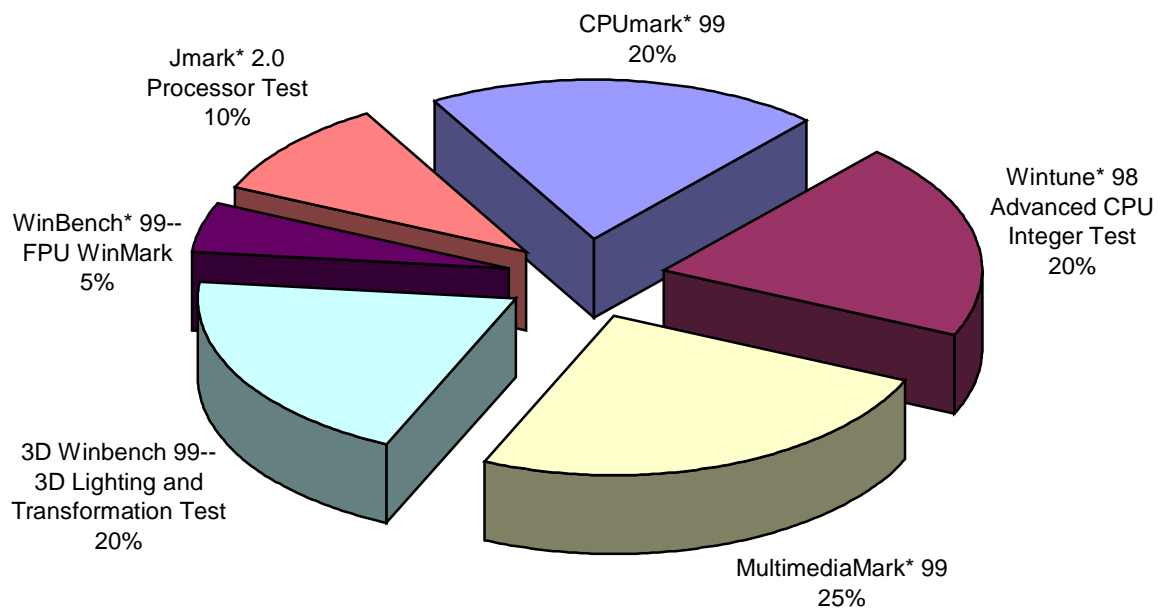


Figure 3. iCOMP® Index 3.0 Composition



## APPENDIX B — iCOMP® INDEX CONFIGURATION

Table 2. System Configuration Used for iCOMP® Index 3.0 Ratings

Processor	<b>Intel Performance Processors: Pentium® II Processor and Pentium III Processor</b>
FPU	Integrated
System	Intel® SE440BX-2
Secondary Cache	512KB
Hard Disk	Adaptec* AHA2940UW2W SCSI/PCI, Seagate Cheetah ST39102LW
Video	Diamond Multimedia Viper* V550 AGP (w/ 16MB SDRAM); Driver: 4.10.01.0239
Audio	Diamond MonsterSound* M80 PCI
<b>Operating System</b>	<b>Windows*98 with Microsoft DirectX 6.1*</b>
Memory Size	128 MB SDRAM
Graphics	1024x768 Resolution, 16-bit color